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EXECUTIVE SUMMARY

DOMTAR QUARRY SURFACE WATER SURVEY
THIRD ANNUAL REPORT, 1984

A. Golomb
Environmental and Inorganic Section
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Since December, 1981, fly ash from Lakeview TGS has been disposed of as landfill at Domtar Quarry, Mississauga, in accordance with a Provisional Certificate of Approval issued by the Ontario Ministry of the Environment which requires regular monitoring of local surface water and ground water. Mary Fix Creek, which traverses the Domtar Quarry ash disposal site, was sampled twice during 1984. To date no fly ash leachate has been discharged from the underdrain sump to the Creek. One sampling was done under spring runoff/heavy rainfall conditions, and the other under fall base flow conditions. No change in major ion chemistry was observed along the flow path studied on either sampling date. Unusually high levels of total trace metals observed in unfiltered samples taken at fast flow rates during spring runoff are attributed to suspended particulate local earth materials.

job	file	date	report no.
740631-130-892	837.71	December 20, 1984	84-453-K

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To Mr. D. Erwin
Manager of Procurement - General Products
Supply Division

Attn: Mr. J.H.P. Buckingham
Senior Supervisor
Ash Management

DOMTAR QU[illegible]Y SURFACE WATER SURVEY
THIRD ANNUAL REPORT, 1984

A. Golomb

Two samplings of Mary Fix Creek were carried out in 1984. To date, no fly ash leachate has been discharged to the Creek. One sampling was done under spring runoff/heavy rainfall conditions, and the other under fall base flow conditions. No change in major ion chemistry was observed to have taken place along the flow path studied on either sampling date. Unusually high levels of total trace metals observed in unfiltered samples taken at fast flow rates during spring runoff are attributed to suspended particulate local earth materials.

1. INTRODUCTION

In accordance with the MOE's Provisional Certificate No A220113, a monitoring program of surface water quality and water flow of the Mary Fix Creek has been under way at the Domtar Quarry Reclamation Project, Mississauga (Figure 1). The first two annual reports/1,2/ showed no significant change in surface water chemistry resulting from fly ash landfill operations, which commenced December 18, 1981. Calibration of the Mary Fix Creek flow rate (Figure 2) was completed in 1983: a 'portable' chain gauge was constructed and has since been used for all flow rate measurements at the CP railway overpass, where the Creek enters Domtar property.

job	file	date	report no.
740631-130-892	837.71	December 20, 1984	84-453-K

2. SURFACE WATER QUALITY MONITORING

As in previous years, no fly ash leachate was discharged into the Mary Fix Creek during 1984. Any leachate that collected in the fly ash leachate sump was pumped into a water spray truck and used for dust suppression at the site. During the year, two samplings were carried out, one under exceptionally high flow conditions (~1.6 m^3/s: spring runoff, February 17, 1984), and the other under base flow conditions (0.03 m^3/s: September 30, 1984).

Water samples were taken at each of four locations:

(i) CP Overpass (CPO)
(ii) South Property Fence (SPF)
(iii) Dundas Street Culvert (DSC)
and (iv) Paisley Street Bridge (PSB)[1]

To meet an MOE requirement for determination of total trace heavy metals in surface waters/3/, duplicate samples were taken. The following procedure (described in detail in Appendix A) was followed:

A pair of 1-L samples was taken at each location. One of each pair was filtered through a 0.45 µm Millipore filter prior to submission for chemical analysis, while the other was submitted unfiltered for determination of total trace heavy metals (except mercury)/3/.

Complete analytical details are given in Tables I to IV, together with all of the previous data to facilitate comparison. Major ion chemistry is summarized in Tables V to VIII. This data was used to construct Piper trilinear diagrams for each of the four sampling points.

2.1 Major Ion Chemistry

Samplings were carried out as described above on February 17, 1984, and September 30, 1984[2]. Major ion chemistry is given in

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[1] Due to recent land development, the Creek was sampled about a city block downstream of the actual bridge in September, 1984.

[2] Analytical data for the filtered sample is referred to in computerized tabulations by actual sampling date; analytical data for the non-filtered sample is referenced to the next day.

Tables IV to VIII. Mary Fix Creek water passing through Domtar Quarry (see Piper diagrams, Figures 3 to 6) during the spring runoff was found to lie consistently just inside the region of dominance of alkali metals and strong acid anions. For the fall sampling (base flow conditions) Creek water consistently showed no dominance of major ions along the entire flow path studied. In summary, no change in major ion chemistry of Mary Fix Creek water occurred on either sampling date as a result of passage through Domtar Quarry. For all of the spring runoff non-filtered samples, there was some degree of stoichiometric excess of major cations (especially Ca, Mg, K) over major anions. This can be attributed to an increased level of suspended solids (nearly 400 mg/L) found in the surface water taken during the runoff, which coincided with very heavy rainfall and unseasonably mild temperatures. The turbulent flow evidently washed particulate local earth materials (especially fine shale solids) into the Creek. The HNO_3/HCl acid digestion analytical procedure/4/ for total metals determination would then give increased levels of major cations found in the non-filtered samples compared with the corresponding levels in the filtered samples. (Anion analysis was done on an un-acidified portion.)

2.2 Minor/Trace Metal Chemistry

Salient features of the minor/trace component chemistry for February, 1984, are summarized an Table IX. For the filtered and non-filtered samples, there were a number of significant differences between concentrations of minor/trace metal components. Higher levels of Al, As, Cu, Fe, Mn, Ni, Pb, V, Zn and SiO_2 were found consistently in the non-filtered samples; this is evidently due to presence of suspended solids which are subsequently dissolved in the acid digestion analytical procedure. Total levels of Fe, Cu, Ni and Zn were found to exceed MOE Objectives to various extents (Fe levels were by far the highest; it is also noteworthy that SiO_2, for which there is no published MOE Objective, increased significantly between the CP overpass and the downstream sampling points).

Fe, Al and Si are major components of Haydite and CKS shale, which are indiginous to the Domtar Quarry area/5/. Little is known about the chemical composition of other local earth materials, except that they may possibly contain soluble Ca, Mg and K (see above for major ion chemistry).

Since no fly ash leachate has been discharged to the Creek to date, the observed high levels of certain minor/trace metals (Table IX) can hardly be attributed to fly ash placement at the site, but rather to locally indigenous earth materials. As previously reported/2,5/, research studies at Ontario Hydro

Research Division led to the conclusion that presence of fly ash at the site should have an ameliorative rather than an adverse effect on local water quality.

For the September, 1984, sampling (Tables I to IV) under base flow conditions, minor and trace metal components were below published MOE Objectives/3/, except for Fe, Cu and Zn, especially in the non-filtered samples. Analytical difficulties were encountered with Hg for the September sampling; these are at present being resolved.

3.0 SUMMARY AND CONCLUSIONS

Two samplings of Mary Fix Creek were carried out during 1984, one during spring runoff and the other during fall base flow conditions. For the spring sampling, all samples had major ion chemistry just within the region of dominance of alkali metal cations and strong acid anions. There was no dominance of major ions during the fall sampling. No fly ash leachate has been discharged to the Creek to date. Elevated levels of total trace metals determined in unfiltered samples especially those taken at fast flow rates during spring runoff, are attributed to presence of suspended particulate earth materials of local origin. The monitoring programme continues.

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AG:lg

REFERENCES

1. Ontario Hydro Research Division Report No 82-480-K.

2. Ontario Hydro Research Division Report No 83-523-K.

3. "Water Management. Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment". Published November, 1978.

4. "Standard Methods for the Examination of Water and Wastewater", 15th Edition, Part 302, American Public Health Association, New York, N.Y., 1980.

5. D.J.R. Dodd, Ontario Hydro Research Division Report No C81-6-K.

APPENDIX A

SURFACE WATER SAMPLE COLLECTION AND PREPARATION FOR ANALYSIS

Pairs of samples from each location were collected in specially acid-pretreated linear polyethylene (LPE) 1-L bottles, stored in a cooler (-4°C) and returned the same day to the laboratory. Details of sample handling and preservation, prior to submission for detailed chemical analysis, are described below.

(a) Filtered Samples

One sample of each pair was filtered in the laboratory through a 0.45 µm Millipore filter to remove suspended solids. The glass Millipore vacuum filtration apparatus was cleaned by soaking in 1:1 hydrochloric acid (HCl) followed by a deionized water rinse and a further soaking in 1:1 nitric acid (HNO_3). This was followed by several thorough rinsings with deionized water. Millipore filters were rinsed by passing 500 mL of deionized water through the filter and discarding the filtrate. A small volume (-20 mL) of the sample was passed through the filter and also discarded, then the bulk of the sample was filtered. The empty original sample container was rinsed several times with deionized water, given a final rinse using a small volume (-10 mL) of sample filtrate, and reused for storing the unacidified portion.

The portion of the filtrate for trace metal analysis was acidified with ultrapure HNO_3 to a background concentration of 0.1 M. The unacidified portion for alkalinity and anion analysis was stored at -4°C.

(b) Unfiltered Samples

To determine total concentrations of dissolved components (in particular, trace metals), samples were submitted for chemical analysis without filtration in accordance with MOE Objectives/3/. A portion of each was acidified with ultrapure HNO_3 to a background of 0.1 M, and an unacidified portion stored at -4°C pending alkalinity and anion analysis.

APPENDIX B

ANALYTICAL DATA, MAJOR ION BALANCES AND PIPER DIAGRAMS*

*Notes: On computer printouts, sampling locations are indicated as follows:

CPO = CP Overpass
SPF = South Property Fence
DSC = Dundas Street Culvert
PSB = Paisley Street Bridge

On Piper Diagrams

⊙ denotes before ash placement commenced
• denotes after ash placement commenced

TABLE I

DOMTAR SURFACE WATER

LOCATION : CPO

SAMPLING DATE

TEST	800507	811130	820314	820324	820813	820827	820924	830921	830922*	831017
AG	--	<.00020	--	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020
AL	--	<.200	--	<.200	<.600	<.200	<.500	<.500	<.500	<.500
ALKCO3	2.00	--	<5.00	<5.00	24.0	<5.00	10.0	26.0	24.0	<5.00
ALKHCO3	201.	110.	36.0	86.0	240.	64.0	137.	163.	165.	64.0
ALKOH	<5.00	--	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
AS	--	.00100	--	<.00100	.00100	<.00200	<.00200	<.00100	<.00100	.00100
B	--	<.500	--	<1.00	<.500	<.500	<1.00	.160	.190	.110
BA	--	<1.00	--	<2.00	<8.00	1.00	1.30	<2.00	<.500	<1.00
BE	--	--	--	--	<.00020	<.00020	<.00020	--	--	--
BR	--	.100	--	<.200	.600	<.200	1.40	.210	.590	<.0500
CA	81.0	57.0	15.0	34.0	116.	43.0	72.0	89.0	88.0	29.0
CD	--	.00090	--	.00030	<.00010	<.00010	<.00010	<.00010	<.00010	<.00010
CL	136.	40.0	26.0	60.0	177.	22.0	85.0	120.	130.	24.0
CO	--	--	--	--	--	--	<.0500	--	--	--
COND	94.0	47.0	19.0	39.0	124.	35.0	66.0	94.0	94.0	28.3
CR	--	<.100	--	<.0500	<.0500	.00300	<.100	<.100	<.100	<.100
CR(VI)	--	.00900	--	--	.00400	--	--	<.0100	<.0100	<.0100
CU	--	.00300	--	.00500	.00400	.00800	.00300	.00400	.00500	.00300
FE	--	<.0500	--	.0500	<.0500	<.0500	<.0100	<.0500	.460	.130
HARD	303.	208.	49.0	120.	429.	142.	250.	313.	315.	96.0
HG	--	--	--	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020
I	--	<.0100	--	<.0200	<.200	<.0500	<.0500	<.00500	<.00500	<.00500
K	6.00	4.90	3.90	4.30	4.90	3.40	4.90	.660	.670	4.90
MG	24.4	16.0	2.70	8.30	34.0	8.40	18.0	22.0	23.0	5.70
MN	--	<.0500	--	.200	.240	<.0200	<.0200	.0500	.0600	<.0500
MO	--	<.500	--	<.500	<.500	<.500	<.500	<.500	<.500	<.500
NA	60.0	20.0	16.0	27.0	97.0	12.0	34.0	71.0	71.0	16.0
NI	--	<.00500	--	<.00500	<.00500	<.00500	<.00500	<.00500	<.00500	<.00500
NO3	<.100	<.100	--	.100	<.200	17.0	4.50	<1.00	.440	.0200
PB	--	.00200	--	<.00200	<.00200	<.00200	<.00200	<.00200	<.00200	.00200
PH	8.30	8.10	7.00	7.80	8.20	7.90	8.00	8.30	8.20	7.90
SE	--	.00100	--	<.00100	<.00200	<.00200	<.00200	<.00100	<.00100	<.00100
SIO2	--	5.00	--	3.30	4.80	3.60	7.40	7.47	7.10	3.89
SO4	81.0	70.0	14.0	26.0	140.	49.0	95.0	95.0	94.0	30.0
SR	--	.130	--	.140	.800	.130	.280	.560	.500	.120
TDS105	--	370.	--	260.	756.	288.	380.	628.	614.	190.
TI	--	<.500	--	<1.00	<2.00	<1.00	<1.00	<1.00	<1.00	<1.00
TOC	--	--	--	15.0	22.0	12.0	17.0	6.00	4.00	8.00
TSS105	--	22.0	--	--	--	--	31.0	7.00	7.00	300.
U	--	<.0100	--	<.0100	--	<.0200	<.00100	<.0100	<.0100	<.0500
V	--	<.00500	--	<.0100	--	<.00300	<.500	<.00500	<.00500	<.00500
ZN	--	<.0200	--	<.0200	<.0200	<.0200	<.0200	<.0200	<.0200	<.0200

*Non-filtered sample.

TABLE I (cont'd)

DOMTAR SURFACE WATER

LOCATION : CPD

TEST	831018 [a]	840217	840218 [a]	840930	841001 [a]
	SAMPLING DATE				
AG	<.00020	<.00020	<.00020	<.00020	<.00020
AL	6.00	<.500	6.80	<.500	1.60
ALKCO3	<5.00	<5.00	<5.00	7.00	<5.00
ALKHCO3	68.0	37.0	45.0	95.0	103.
ALKOH	<5.00	<5.00	<5.00	<5.00	<5.00
AS	<.00100	<.00100	.00100	<.00100	<.00100
B	.110	.0800	.0500	<.0500	<.0500
BA	<1.00	<1.00	<1.00	<2.00	<2.00
BR	<.0500	<.100	<.100	<.200	.200
CA	31.0	21.4	26.9	34.7	46.1
CD	.00020	<.00010	<.00010	<.00010	<.00010
CL	24.0	61.5	66.1	99.0	98.0
COND	28.6	34.0	34.0	62.0	61.0
CR	<.100	<.0500	<.0500	<.100	<.100
CR(VI)	<.0100	<.0100	<.0100	<.0100	<.0100
CU	.0100	.00900	.0120	.00200	.00800
FE	5.60	.100	9.60	<.100	.880
HARD	119.	71.0	116.	137.	166.
HG	<.00020	<.00020	<.00020	*	*
I	<.00500	<.0500	<.0500	.0600	<.0600
K	6.30	3.10	7.30	4.87	5.49
MG	7.80	4.30	7.70	12.2	12.5
MN	.260	.0800	.340	<.0500	<.0500
MO	<.500	<.500	<.500	<.500	<.500
NA	16.0	35.0	33.0	34.6	47.8
NI	.00600	<.00500	.0100	<.00500	<.00500
NO3	1.43	4.09	4.20	.130	.0900
PB	.0160	<.00200	.00800	<.00200	<.00200
PH	7.70	7.40	7.50	7.90	7.60
SE	<.00100	<.00100	<.00100	<.00100	<.00100
SIO2	3.70	2.94	12.0	2.70	8.50
SO4	29.0	17.3	18.3	44.0	43.0
SR	.150	.100	.130	.340	.340
TDS105	190.	222.	230.	392.	378.
TI	<1.00	<1.00	<1.00	<1.00	<1.00
TOC	10.0	12.4	12.3	25.0	25.0
TSS105	15.0	--	387.	--	49.0
U	<.0500	<.0100	<.0100	<.0500	<.0500
V	<.00500	<.00500	.0300	<.0100	<.0100
ZN	.0400	<.0200	.0300	<.0200	<.0200

* Analytical difficulties with Hg.

a Non-filtered sample.

TABLE II

DOMTAR SURFACE WATER

LOCATION : SPF

SAMPLING DATE

TEST	800507	811130	820314	820324	820813	820827	820924	830921	830922*	831017
AG	--	.00020	--	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020
AL	--	<.200	--	<.200	<3.00	<.200	<.500	<.500	<.500	<.500
ALKCO3	5.60	--	<5.00	<5.00	14.0	<5.00	13.0	14.0	25.0	<5.00
ALKHCO3	190.	110.	40.0	83.0	99.0	63.0	120.	117.	107.	67.0
ALKOH	<5.00	--	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
AS	--	.00100	--	<.00100	<.00100	<.00200	<.00200	.00100	.00100	.00500
B	--	<.500	--	<1.00	2.50	<.500	<1.00	2.10	2.11	.200
BA	--	<1.00	--	<2.00	<40.0	1.00	1.40	<2.00	<2.00	<1.00
BE	--	--	--	--	<.00020	<.00020	<.00020	--	--	--
BR	--	.100	--	<.200	16.0	.300	1.50	12.0	12.0	.150
CA	79.0	57.0	17.0	33.0	259.	45.0	72.0	207.	208.	29.0
CD	--	.00020	--	<.00100	<.00010	<.00010	<.00010	<.00010	<.00010	.00010
CL	122.	42.0	34.0	55.0	1700.	41.0	215.	1200.	1130.	35.0
CO	--	--	--	--	--	--	<.0500	--	--	--
COND	90.0	50.0	23.3	36.5	600.	43.0	107.	445.	445.	34.0
CR	--	<.100	--	<.0500	<.0500	.00400	<.100	<.100	<.100	<.100
CR(VI)	--	.00500	--	--	.00400	--	--	<.0100	<.0100	<.0100
CU	--	.00300	--	.00500	.00700	.00700	.00300	.00300	.00400	.00300
FE	--	.0500	--	.0500	<.0500	<.0500	<.100	<.0500	.410	.130
HARD	291.	215.	56.0	116.	869.	148.	250.	707.	712.	97.0
HG	--	--	--	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020
I	--	<.0100	--	<.0200	<1.00	<.0500	<.0500	<.0200	<.0200	<.00500
K	5.00	5.40	4.00	4.60	42.0	4.10	9.00	35.0	35.0	6.20
MG	22.0	16.0	3.30	8.10	54.0	8.60	18.0	44.0	47.0	6.10
MN	--	<.0500	--	.200	.0400	<.0200	<.0200	.0500	.0600	<.0500
MO	--	.500	--	<.500	<.500	<.500	<.500	<.500	<.500	<.500
NA	61.0	26.0	19.0	28.0	980.	2.90	105.	630.	640.	27.0
NI	--	<.00500	--	<.00500	.0120	<.00500	<.00500	<.00500	<.00500	<.00500
NO3	<.100	<.100	--	.100	15.0	21.0	8.00	13.0	10.1	1.36
PB	--	<.00200	--	.0200	<.00200	<.00200	<.00200	<.00200	<.00200	.00200
PH	8.50	8.20	7.40	7.90	8.20	7.90	8.10	8.20	8.10	7.50
SE	--	<.00100	--	<.00100	<.00200	<.00200	<.00200	.00300	.00300	<.00100
SIO2	--	6.50	--	3.80	2.60	4.00	6.80	4.67	3.98	3.66
SO4	70.0	72.0	14.0	23.0	450.	63.0	145.	330.	330.	38.0
SR	--	.130	--	.140	4.80	.200	.640	2.35	2.85	.190
TDS105	--	370.	--	252.	3770.	260.	620.	2010.	2680.	220.
TI	--	<.500	--	<1.00	<10.0	<1.00	<1.00	<1.00	<1.00	<1.00
TOC	--	--	--	15.0	9.00	10.0	17.0	12.0	14.0	13.0
TSS105	--	41.0	--	--	--	--	85.0	15.0	15.0	1730.
U	--	<.0100	--	<.0100	--	<.0200	<.00100	<.0500	<.0500	<.0500
V	--	<.00500	--	<.0100	--	<.00300	<.500	<.0200	<.0200	<.00500
ZN	--	<.0200	--	<.0200	<.0200	<.0200	<.0200	<.0200	<.0200	<.0200

*Non-filtered sample.

TABLE II (cont'd)

DOMTAR SURFACE WATER

LOCATION : SPF

TEST	SAMPLING DATE 831018[a]	840217	840218[a]	840930	841001[a]
AG	<.00020	<.00020	<.00020	<.00020	<.00020
AL	23.0	<.500	9.00	<.500	1.90
ALKCO3	<5.00	<5.00	<5.00	9.00	<5.00
ALKHCO3	94.0	39.0	50.0	94.0	103.
ALKOH	<5.00	<5.00	<5.00	<5.00	<5.00
AS	<.00100	<.00100	.00200	<.00100	<.00100
B	.200	.0700	.0700	.150	.200
BA	<1.00	<1.00	<1.00	<2.00	3.00
BR	.250	<.100	.200	.500	.500
CA	40.0	22.0	35.0	35.7	49.9
CD	.00030	<.00010	<.00010	<.00010	<.00010
CL	35.0	65.4	66.6	125.	118.
COND	34.1	36.0	37.0	70.0	70.0
CR	<.100	<.0500	<.0500	<.100	<.100
CR(VI)	<.0100	<.0100	<.0100	<.0100	<.0100
CU	.0300	.00300	.0170	.00800	.00700
FE	38.0	.0900	16.0	<.100	1.48
HARD	250.	73.0	159.	120.	164.
HG	<.00020	<.00020	<.00020	*	*
I	<.00500	<.0500	<.0500	<.0600	<.0600
K	9.20	3.40	8.30	3.98	5.45
MG	20.0	4.50	10.5	7.50	9.60
MN	.750	.0800	.460	<.0500	<.0500
MO	<.500	<.500	<.500	<.500	<.500
NA	27.0	43.0	36.0	49.4	70.8
NI	.0240	<.00500	.0100	<.00500	<.00500
NO3	2.21	3.94	4.91	.180	.130
PB	.0210	<.00200	.0100	<.00200	<.00200
PH	7.80	7.30	7.60	7.90	7.70
SE	<.00100	<.00100	<.00100	<.00100	<.00100
SIO2	3.64	3.11	103.	2.70	9.80
SO4	36.0	18.5	19.6	50.0	45.6
SR	.280	.120	.160	.490	.520
TDS105	240.	230.	244.	423.	430.
TI	<1.00	<1.00	<1.00	<1.00	<1.00
TOC	12.0	11.8	13.5	19.0	21.0
TSS105	31.0	--	590.	--	60.0
U	<.0500	<.0100	<.0100	<.0500	<.0500
V	.0170	<.00500	.0800	<.0100	<.0100
ZN	.120	<.0200	.0400	<.0200	<.0200

* Analytical difficulties with Hg.

a Non-filtered sample.

TABLE III

DOMTAR SURFACE WATER

LOCATION : DSC

TEST	800507	811130	820314	820324	SAMPLING DATE 820813	820827	820924	830921	830922*	831017
AG	--	--	--	--	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020
AL	--	--	--	--	<3.00	<.200	<.500	<.500	<.500	<.500
ALKCO3	--	--	<5.00	--	17.0	<5.00	13.0	15.0	27.0	<5.00
ALKHCO3	--	--	36.0	--	92.0	66.0	121.	121.	110.	75.0
ALKOH	--	--	<5.00	--	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
AS	--	--	--	--	<.00100	<.00200	<.00200	.00100	.00100	.00400
B	--	--	--	--	2.50	<.500	<1.00	2.05	2.06	.180
BA	--	--	--	--	<40.0	1.00	1.30	<2.00	<2.00	<1.00
BE	--	--	--	--	<.00020	<.00020	<.00020	--	--	--
BR	--	--	--	--	14.0	.300	.200	12.0	10.0	.150
CA	--	--	15.0	--	262.	44.0	70.0	214.	208.	33.0
CD	--	--	--	--	<.00010	<.00010	<.00010	<.00010	<.00010	.00010
CL	--	--	26.0	--	1570.	38.0	165.	1200.	1030.	40.0
CO	--	--	--	--	--	--	<.0500	--	--	--
COND	--	--	20.0	--	560.	42.0	105.	450.	450.	37.6
CR	--	--	--	--	<.0500	.00600	<.100	<.100	<.100	<.100
CR(VI)	--	--	--	--	.00500	--	--	<.0100	<.0100	<.0100
CU	--	--	--	--	.00700	.00700	.00500	.00400	.00400	.00300
FE	--	--	--	--	<.0500	<.0500	<.100	<.0500	.360	.110
HARD	--	--	49.0	--	881.	146.	250.	742.	717.	111.
HG	--	--	--	--	<.00020	.00020	<.00020	<.00020	<.00020	<.00020
I	--	--	--	--	<1.00	<.0500	<.0500	<.0200	<.0200	<.00500
K	--	--	3.90	--	38.0	4.20	9.50	35.0	35.0	5.90
MG	--	--	2.70	--	55.0	8.80	18.0	48.0	48.0	7.20
MN	--	--	--	--	<.0200	<.0200	<.0200	<.0500	.0400	<.0500
MO	--	--	--	--	<.500	<.500	<.500	<.500	<.500	<.500
NA	--	--	14.0	--	835.	2.70	98.0	640.	640.	28.0
NI	--	--	--	--	.0110	<.00500	.00500	<.00500	<.00500	<.00500
NO3	--	--	--	--	13.0	21.0	8.00	11.0	9.73	1.20
PB	--	--	--	--	<.00200	<.00200	<.00200	<.00200	<.00200	.00200
PH	--	--	7.20	--	8.10	7.90	8.20	8.20	8.20	8.10
SE	--	--	--	--	.0220	<.00200	<.00200	.00300	.00300	<.00100
SIO2	--	--	--	--	2.30	2.40	6.40	4.88	4.36	4.24
SO4	--	--	14.0	--	450.	61.0	110.	330.	320.	40.0
SR	--	--	--	--	5.50	.200	.590	2.65	2.65	.220
TDS105	--	--	--	--	3410.	262.	590.	2800.	2860.	240.
TI	--	--	--	--	<10.0	<1.00	<1.00	<1.00	<1.00	<1.00
TOC	--	--	--	--	10.0	9.00	16.0	7.00	7.00	12.0
TSS105	--	--	--	--	--	--	53.0	11.0	11.0	960.
U	--	--	--	--	--	<.0200	<.00100	<.0500	<.0500	<.0500
V	--	--	--	--	--	.00300	<.500	<.0200	<.0200	<.00500
ZN	--	--	--	--	<.0200	<.0200	<.0200	<.0200	<.0200	<.0200

*Non-filtered sample.

TABLE III (cont'd)

DOMTAR SURFACE WATER

LOCATION : DSC

TEST	SAMPLING DATE 831018[a]	840217	840218[a]	840930	841001[a]
AG	<.00020	<.00020	<.00020	<.00020	<.00020
AL	13.0	.500	10.0	<.500	2.80
ALKCO3	<5.00	<5.00	<5.00	<5.00	<5.00
ALKHCO3	91.0	40.0	52.0	104.	108.
ALKOH	<5.00	<5.00	<5.00	<5.00	<5.00
AS	<.00100	<.00100	.00200	<.00100	<.00100
B	.190	.0600	.0600	.160	.230
BA	<1.00	<1.00	<1.00	<2.00	<2.00
BR	.190	<.100	<.100	.700	.300
CA	38.0	22.1	35.0	51.1	41.5
CD	.00020	<.00010	<.00010	<.00010	<.00010
CL	39.0	64.9	68.1	140.	133.
COND	37.8	36.0	38.0	74.0	74.0
CR	<.100	<.0500	<.0500	<.100	<.100
CR(VI)	<.0100	<.0100	<.0100	<.0100	<.0100
CU	.0140	.00300	.0190	.00400	.00800
FE	20.0	.0600	17.5	<.100	1.57
HARD	184.	74.0	164.	180.	159.
HG	<.00020	<.00020	<.00020	*	*
I	<.00500	<.0500	<.0500	<.0600	.350
K	8.10	3.40	9.70	6.96	8.18
MG	13.0	4.60	11.1	12.9	13.7
MN	.420	.0700	.490	<.0500	<.0500
MO	<.500	<.500	<.500	<.500	<.500
NA	28.0	39.0	37.0	78.9	61.9
NI	.0120	<.00500	.0100	<.00500	<.00500
NO3	2.13	3.87	4.88	.180	.130
PB	.0160	<.00200	.0110	<.00200	<.00200
PH	7.80	7.40	7.60	7.80	7.70
SE	<.00100	<.00100	<.00100	<.00100	<.00100
SIO2	4.00	2.94	103.	2.70	11.5
SO4	41.0	20.1	19.5	54.0	53.4
SR	.280	.120	.170	.500	.970
TDS105	250.	228.	246.	466.	462.
TI	<1.00	<1.00	<1.00	<1.00	1.30
TOC	13.0	12.2	12.7	24.0	26.0
TSS105	24.0	--	630.	--	77.0
U	<.0500	<.0100	<.0100	<.0500	<.0500
V	.0180	<.00500	.0700	<.0100	<.0100
ZN	.0700	<.0200	.0500	<.0200	<.0200

* Analytical difficulties with Hg.

a Non-filtered sample.

TABLE IV

DOMTAR SURFACE WATER

LOCATION : PSB

TEST	SAMPLING DATE 800507	811130	820314	820324	820813	820827	820924	830921	830922*	831017
AG	--	<.00020	--	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020	<.00020
AL	--	<.200	--	<.200	<.600	<.200	<.500	<.500	<.500	<.500
ALKCO3	--	--	--	<5.00	19.0	<5.00	9.00	22.0	27.0	<5.00
ALKHCO3	--	110.	--	86.0	160.	65.0	133.	127.	122.	72.0
ALKOH	--	--	--	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
AS	--	.00100	--	<.00100	<.00100	<.00200	<.00200	.00100	.00100	.00300
B	--	<.500	--	<1.00	<.500	<.500	<1.00	1.66	1.71	.200
BA	--	<1.00	--	<2.00	<8.00	1.00	1.40	<2.00	<2.00	<1.00
BE	--	--	--	--	<.00020	<.00020	<.00020	--	--	--
BR	--	.100	--	<.200	1.60	.300	.600	11.0	10.0	.210
CA	--	58.0	--	34.0	97.0	43.0	70.0	225.	223.	30.0
CD	--	.00100	--	<.00010	<.00010	<.00010	<.00010	<.00010	<.00010	<.00010
CL	--	46.0	--	50.0	242.	30.0	165.	1100.	1060.	36.0
CO	--	--	--	--	--	--	<.0500	--	--	--
COND	--	48.0	--	39.0	141.	41.0	79.0	420.	420.	35.0
CR	--	<.100	--	<.0500	<.0500	.00400	<.100	<.100	<.100	<.100
CR(VI)	--	.00500	--	--	.00400	--	--	<.0100	<.0100	<.0100
CU	--	.00300	--	.00500	.0130	.0120	.00700	.00500	.00400	.00300
FE	--	<.0500	--	.0500	<.0500	<.0500	<.100	<.0500	.230	.380
HARD	--	211.	--	120.	333.	143.	250.	759.	770.	93.0
HG	--	--	--	<.00020	<.00020	.00020	<.00020	<.00020	<.00020	<.00020
I	--	<.0100	--	<.0200	<.200	<.0500	<.0500	<.0200	<.0200	<.00500
K	--	5.80	--	4.70	11.0	4.20	6.20	29.0	29.0	5.90
MG	--	16.0	--	8.10	22.0	8.70	18.0	51.0	52.0	6.70
MN	--	<.0500	--	<.100	<.0200	<.0200	<.0200	<.0500	<.0500	<.0500
MO	--	<.500	--	<.500	<.500	<.500	<.500	<.500	<.500	<.500
NA	--	26.0	--	30.0	173.	2.70	55.0	570.	570.	27.0
NI	--	<.00500	--	<.00500	<.00500	<.00500	.0100	<.00500	<.00500	<.00500
NO3	--	.500	--	.100	3.00	20.0	8.00	7.90	7.68	1.78
PB	--	.00900	--	<.00200	<.00200	<.00200	<.00200	<.00200	<.00200	.00200
PH	--	8.10	--	7.90	8.30	7.90	8.00	8.30	8.20	8.00
SE	--	<.00100	--	<.00100	.00400	<.00200	<.00200	.00200	.00200	<.00100
SIO2	--	15.0	--	2.60	3.70	4.10	6.20	5.62	5.09	3.66
SO4	--	74.0	--	24.0	175.	59.0	140.	310.	290.	30.0
SR	--	.130	--	.140	1.12	.200	.400	2.50	2.50	.220
TDS105	--	370.	--	236.	848.	242.	490.	2700.	2730.	220.
TI	--	<.500	--	<1.00	<2.00	<1.00	<1.00	<1.00	<1.00	<1.00
TOC	--	--	--	14.0	17.0	10.0	16.0	5.00	2.00	13.0
TSS105	--	48.0	--	--	--	--	34.0	7.00	7.00	1130
U	--	<.0100	--	<.0100	--	<.0200	<.00100	<.0500	<.0500	<.0500
V	--	<.00500	--	<.0100	--	<.00300	<.500	<.0200	<.0200	<.00500
ZN	--	<.0200	--	<.0200	<.0200	<.0200	<.0200	<.0200	<.0200	<.0200

*Non-filtered sample.

TABLE IV (cont'd)

DOMTAR SURFACE WATER

LOCATION : PSB

TEST	831018 [a]	840217	840218 [a]	840930	SAMPLING DATE 841001 [a]
AG	<.00020	<.00020	<.00020	<.00020	<.00020
AL	13.0	<.500	12.0	<.500	1.80
ALKCO3	<5.00	<5.00	<5.00	12.0	<5.00
ALKHCO3	87.0	40.0	55.0	129.	140.
ALKOH	<5.00	<5.00	<5.00	<5.00	<5.00
AS	<.00100	<.00100	.00300	<.00100	<.00100
B	.150	.0700	.0600	.330	.350
BA	<1.00	<1.00	<1.00	<2.00	<2.00
BR	<.0500	<.100	<.100	.900	.600
CA	38.0	22.6	41.0	63.5	66.5
CD	.00020	<.00010	<.00010	<.00010	<.00010
CL	35.0	65.4	66.7	140.	138.
COND	35.2	36.0	38.0	86.0	86.0
CR	<.100	<.0500	<.0500	<.100	<.100
CR(VI)	<.0100	<.0100	<.0100	<.0100	<.0100
CU	.0140	.00300	.0230	.00400	.00600
FE	20.0	.0600	21.6	<.100	1.08
HARD	184.	75.0	194.	223.	235.
HG	<.00020	<.00020	<.00020	*	*
I	<.00500	<.0500	<.0500	<.0600	<.0600
K	7.90	3.50	8.70	9.21	10.3
MG	13.0	4.60	13.0	15.8	16.7
MN	.400	.0800	.650	<.00500	<.0500
MO	<.500	<.500	<.500	<.500	<.500
NA	28.0	40.0	38.0	87.4	86.6
NI	.0120	<.00500	.0100	<.00500	<.00500
NO3	2.00	3.94	5.01	.180	.130
PB	.0170	<.00200	.0230	<.00200	<.00200
PH	7.80	7.50	7.60	8.00	7.80
SE	<.00100	<.00100	<.00100	<.00100	<.00100
SIO2	3.66	3.39	126.	5.30	8.30
SO4	37.0	18.6	19.5	74.0	81.0
SR	.270	.120	.200	1.07	1.00
TDS105	230.	228.	250.	520.	516.
TI	<1.00	<1.00	<1.00	<1.00	<1.00
TOC	12.0	11.5	10.6	25.0	27.0
TSS105	75.0	--	920.	--	32.0
U	<.0500	<.0100	<.0100	<.0500	<.0500
V	.0110	<.00500	.0800	<.0100	<.0100
ZN	.0700	<.0200	.100	<.0200	<.0200

* Analytical difficulties with Hg.

a Non-filtered sample.

TABLE V

MAJOR ION CHEMISTRY

DOMTARSURF
TYPE - WATER
LOCATION CPO

DOMTAR QUARRY PIPER DIAGRAM

	CATIONS												CATION TOTAL	ANION TOTAL
	CA			MG			NA			K				
DATE	MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L	EPM	%EPM	EPM	EPM
MAY 07 1980	81	4.04	46	24	2.01	23	60	2.61	30	6	.15	2	8.81	9.58
NOV 30 1981	57	2.84	55	16	1.32	26	20	.87	17	5	.13	2	5.15	4.78
MAR 14 1982	15	.75	42	3	.22	13	16	.70	39	4	.10	6	1.77	1.74
MAR 24 1982	34	1.70	46	8	.68	19	27	1.17	32	4	.11	3	3.66	3.95
AUG 13 1982	116	5.79	45	34	2.80	22	97	4.22	33	4	.10	1	12.90	13.18
AUG 27 1982	43	2.14	62	8	.69	20	12	.52	15	3	.09	3	3.44	2.92*
SEPT 24 1982	72	3.59	54	18	1.48	22	34	1.48	22	5	.13	2	6.68	7.31
SEPT 21 1983	89	4.44	47	22	1.81	19	71	3.09	33	1	.02	0	9.35	9.14
SEPT 22 1983	88	4.39	47	23	1.89	20	71	3.09	33	1	.02	0	9.39	9.40
OCT 17 1983	29	1.45	53	6	.47	17	16	.70	25	5	.13	5	2.74	2.58
OCT 18 1983	31	1.55	51	8	.64	21	16	.70	23	6	.16	5	3.04	2.64*
FEB 17 1984	21	1.07	35	4	.35	12	35	1.52	50	3	.08	3	3.02	2.83
FEB 18 1984	27	1.34	37	8	.63	18	33	1.43	40	7	.19	5	3.60	3.14*
SEPT 30 1984	35	1.73	40	12	1.00	23	35	1.50	34	5	.12	3	4.36	5.74*
OCT 01 1984	46	2.30	41	13	1.03	19	48	2.08	37	5	.14	3	5.55	5.71

	ANIONS												ANION TOTAL	CATION TOTAL
	CL			SO4			HCO3			CO3				
DATE	MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L	EPM	%EPM	EPM	EPM
MAY 07 1980	136	3.83	40	81	1.69	18	245	4.02	42	1	.04	0	9.58	8.81
NOV 30 1981	40	1.13	24	70	1.46	30	134	2.20	46	0	.00	0	4.78	5.15
MAR 14 1982	26	.73	42	14	.29	17	44	.72	41	<5.00	.00	0	1.74	1.77
MAR 24 1982	60	1.69	43	26	.54	14	105	1.72	44	<5.00	.00	0	3.95	3.66
AUG 13 1982	177	4.99	38	140	2.91	22	293	4.80	36	14	.48	4	13.18	12.90
AUG 27 1982	22	.62	21	49	1.02	35	78	1.28	44	<5.00	.00	0	2.92	3.44*
SEPT 24 1982	85	2.39	33	95	1.98	27	167	2.74	37	6	.20	3	7.31	6.68
SEPT 21 1983	120	3.38	37	95	1.98	22	199	3.26	36	16	.52	6	9.14	9.35
SEPT 22 1983	130	3.66	39	94	1.96	21	201	3.30	35	14	.48	5	9.40	9.39
OCT 17 1983	24	.68	26	30	.62	24	78	1.28	50	<5.00	.00	0	2.58	2.74
OCT 18 1983	24	.68	26	29	.60	23	83	1.36	52	<5.00	.00	0	2.64	3.04*
FEB 17 1984	62	1.73	61	17	.36	13	45	.74	26	<5.00	.00	0	2.83	3.02

TABLE V (cont'd)

FEB 18 1984	66	1.86	59	18	.38	12	55	.90	29	<5.00	.00	0	3.14	3.60*
SEPT 30 1984	99	2.79	49	44	.92	16	116	1.90	33	4	.14	2	5.74	4.36*
OCT 01 1984	98	2.76	48	43	.89	16	126	2.06	36	<5.00	.00	0	5.71	5.55

* INDICATES ANION AND CATION TOTALS DON'T LIE WITHIN 10% OF EACH OTHER.

+ INDICATES A MAJOR PARAMETER IS MISSING.

TABLE VI

MAJOR ION CHEMISTRY

DOMTARSURF
TYPE - WATER
LOCATION SPF

DOMTAR QUARRY PIPER DIAGRAM

			CATIONS										CATION TOTAL	ANION TOTAL
			CA			MG			NA			K		
DATE			MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L EPM %EPM	EPM	EPM
MAY	07	1980	79	3.94	46	23	1.88	22	61	2.65	31	5 .13 1	8.60	8.97
NOV	30	1981	57	2.84	52	16	1.32	24	26	1.13	21	5 .14 3	5.43	4.88*
MAR	14	1982	17	.85	41	3	.27	13	19	.83	40	4 .10 5	2.05	2.05
MAR	24	1982	33	1.65	45	8	.67	18	28	1.22	33	5 .12 3	3.65	3.69
AUG	13	1982	259	12.92	22	54	4.44	8	900	39.13	68	42 1.07 2	57.57	59.51
AUG	27	1982	45	2.24	71	9	.71	22	3	.13	4	4 .10 3	3.18	3.73*
SEPT	24	1982	72	3.59	36	18	1.48	15	105	4.57	46	10 .25 3	9.89	11.73*
SEPT	21	1983	207	10.32	24	46	3.79	9	630	27.39	65	35 .90 2	42.40	43.29
SEPT	22	1983	208	10.37	24	47	3.87	9	640	27.83	65	35 .90 2	42.96	41.34
OCT	17	1983	29	1.45	44	6	.50	15	27	1.17	36	6 .16 5	3.28	3.12
OCT	18	1983	40	2.00	40	20	1.65	33	27	1.17	23	9 .24 5	5.05	3.61*
FEB	17	1984	22	1.10	32	5	.37	11	43	1.87	55	3 .09 3	3.42	3.01*
FEB	18	1984	35	1.75	40	11	.86	20	36	1.57	36	8 .21 5	4.39	3.28*
SEPT	30	1984	36	1.78	38	8	.62	13	49	2.15	46	4 .10 2	4.65	6.62*
OCT	01	1984	50	2.49	38	10	.79	12	71	3.08	47	5 .14 2	6.50	6.33

			ANIONS										ANION TOTAL	CATION TOTAL
			CL			SO4			HCO3			CO3		
DATE			MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L EPM %EPM	EPM	EPM
MAY	07	1980	122	3.44	38	78	1.62	18	232	3.80	42	3 .11 1	8.97	8.60
NOV	30	1981	42	1.18	24	72	1.50	31	134	2.20	45	0 .00 0	4.88	5.43*
MAR	14	1982	34	.96	47	14	.29	14	49	.80	39	<5.00 .00 0	2.05	2.05
MAR	24	1982	55	1.55	42	23	.48	13	101	1.66	45	<5.00 .00 0	3.69	3.65
AUG	13	1982	1700	47.89	80	450	9.37	16	121	1.98	3	8 .28 0	59.51	57.57
AUG	27	1982	41	1.15	31	63	1.31	35	77	1.26	34	<5.00 .00 0	3.73	3.18*
SEPT	24	1982	215	6.06	52	145	3.02	26	146	2.40	20	8 .26 2	11.73	9.89*
SEPT	21	1983	1200	33.80	78	330	6.87	16	143	2.34	5	8 .28 1	43.29	42.40
SEPT	22	1983	1130	31.83	77	330	6.87	17	131	2.14	5	15 .50 1	41.34	42.96
OCT	17	1983	35	.99	32	38	.79	25	82	1.34	43	<5.00 .00 0	3.12	3.28
OCT	18	1983	35	.99	27	36	.75	21	115	1.88	52	<5.00 .00 0	3.61	5.05*
FEB	17	1984	65	1.84	61	19	.39	13	48	.78	26	<5.00 .00 0	3.01	3.42*

TABLE VI (cont'd)

FEB 18 1984	67	1.88	57	20	.41	12	61	1.00	30	<5.00	.00	0	3.28	4.39*
SEPT 30 1984	125	3.52	53	50	1.04	16	115	1.88	28	5	.18	3	6.62	4.65*
OCT 01 1984	118	3.32	52	46	.95	15	126	2.06	33	<5.00	.00	0	6.33	6.50

* INDICATES ANION AND CATION TOTALS DON'T LIE WITHIN 10% OF EACH OTHER.

+ INDICATES A MAJOR PARAMETER IS MISSING.

TABLE VII

MAJOR ION CHEMISTRY

DOMTARSURF
TYPE - WATER
LOCATION DSC

DOMTAR QUARRY PIPER DIAGRAM

CATIONS

DATE	CA MG/L	CA EPM	CA %EPM	MG MG/L	MG EPM	MG %EPM	NA MG/L	NA EPM	NA %EPM	K MG/L	K EPM	K %EPM	CATION TOTAL EPM	ANION TOTAL EPM
MAR 14 1982	15	.75	45	3	.22	13	14	.61	36	4	.10	6	1.68	1.74
AUG 13 1982	262	13.07	24	55	4.53	8	835	36.30	66	38	.97	2	54.87	55.91
AUG 27 1982	44	2.19	70	9	.72	23	3	.12	4	4	.11	3	3.14	3.66*
SEPT 24 1982	70	3.49	37	18	1.48	16	98	4.26	45	10	.24	3	9.48	9.62
SEPT 21 1983	214	10.67	25	48	3.95	9	640	27.83	64	35	.90	2	43.35	43.39
SEPT 22 1983	208	10.37	24	48	3.95	9	640	27.83	65	35	.90	2	43.05	38.41*
OCT 17 1983	33	1.65	46	7	.59	16	28	1.22	34	6	.15	4	3.61	3.46
OCT 18 1983	38	1.90	43	13	1.07	24	28	1.22	28	8	.21	5	4.39	3.77*
FEB 17 1984	22	1.10	34	5	.38	12	39	1.70	52	3	.09	3	3.26	3.05
FEB 18 1984	35	1.75	39	11	.91	20	37	1.61	36	10	.25	5	4.52	3.36*
SEPT 30 1984	51	2.55	35	13	1.06	15	79	3.43	48	7	.18	2	7.22	7.15
OCT 01 1984	42	2.07	34	14	1.13	18	62	2.69	44	8	.21	3	6.10	7.02*

ANIONS

DATE	CL MG/L	CL EPM	CL %EPM	SO4 MG/L	SO4 EPM	SO4 %EPM	HCO3 MG/L	HCO3 EPM	HCO3 %EPM	CO3 MG/L	CO3 EPM	CO3 %EPM	ANION TOTAL EPM	CATION TOTAL EPM
MAR 14 1982	26	.73	42	14	.29	17	44	.72	41	<5.00	.00	0	1.74	1.68
AUG 13 1982	1575	44.37	79	450	9.37	17	112	1.84	3	10	.34	1	55.91	54.87
AUG 27 1982	38	1.07	29	61	1.27	35	81	1.32	36	<5.00	.00	0	3.66	3.14*
SEPT 24 1982	165	4.65	48	110	2.29	24	148	2.42	25	8	.26	3	9.62	9.48
SEPT 21 1983	1200	33.80	78	330	6.87	16	148	2.42	6	9	.30	1	43.39	43.35
SEPT 22 1983	1030	29.01	76	320	6.66	17	134	2.20	6	16	.54	1	38.41	43.05*
OCT 17 1983	40	1.13	33	40	.83	24	91	1.50	43	<5.00	.00	0	3.46	3.61
OCT 18 1983	39	1.10	29	41	.85	23	111	1.82	48	<5.00	.00	0	3.77	4.39*
FEB 17 1984	65	1.83	60	20	.42	14	49	.80	26	<5.00	.00	0	3.05	3.26
FEB 18 1984	68	1.92	57	20	.41	12	63	1.04	31	<5.00	.00	0	3.36	4.52*
SEPT 30 1984	140	3.94	55	54	1.12	16	127	2.08	29	<5.00	.00	0	7.15	7.22
OCT 01 1984	133	3.75	53	53	1.11	16	132	2.16	31	<5.00	.00	0	7.02	6.10*

TABLE VII (cont'd)

* INDICATES ANION AND CATION TOTALS DON'T LIE WITHIN 10% OF EACH OTHER.

+ INDICATES A MAJOR PARAMETER IS MISSING.

TABLE VIII

MAJOR ION CHEMISTRY

DOMTARSURF
TYPE - WATER
LOCATION PSB

DOMTAR QUARRY PIPER DIAGRAM

		CATIONS												CATION TOTAL	ANION TOTAL
		CA			MG			NA			K				
DATE		MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L	EPM	%EPM	EPM	EPM
NOV 30 1981		58	2.89	53	16	1.32	24	26	1.13	21	6	.15	3	5.49	5.04
MAR 24 1982		34	1.70	45	8	.67	18	30	1.30	34	5	.12	3	3.79	3.63
AUG 13 1982		97	4.84	33	22	1.81	13	173	7.52	52	11	.28	2	14.45	14.04
AUG 27 1982		43	2.14	70	9	.72	23	3	.12	4	4	.11	3	3.09	3.60*
SEPT 24 1982		70	3.49	46	18	1.48	20	55	2.39	32	6	.16	2	7.52	10.40*
SEPT 21 1983		220	10.97	27	51	4.20	10	570	24.78	61	29	.74	2	40.69	40.42
SEPT 22 1983		223	11.12	27	52	4.28	10	570	24.78	61	29	.74	2	40.93	38.87
OCT 17 1983		30	1.50	44	7	.55	16	27	1.17	35	6	.15	4	3.37	3.24
OCT 18 1983		38	1.90	43	13	1.07	24	28	1.22	28	8	.20	5	4.38	3.50*
FEB 17 1984		23	1.13	34	5	.38	11	40	1.74	52	4	.09	3	3.33	3.03
FEB 18 1984		41	2.04	41	13	1.07	21	38	1.65	33	9	.22	4	4.99	3.38*
SEPT 30 1984		64	3.17	37	16	1.30	15	87	3.80	45	9	.24	3	8.50	8.30
OCT 01 1984		67	3.32	38	17	1.37	16	87	3.77	43	10	.26	3	8.72	8.37

		ANIONS												ANION TOTAL	CATION TOTAL
		CL			SO4			HCO3			CO3				
DATE		MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L	EPM	%EPM	MG/L	EPM	%EPM	EPM	EPM
NOV 30 1981		46	1.30	26	74	1.54	31	134	2.20	44	0	.00	0	5.04	5.49
MAR 24 1982		50	1.41	39	24	.50	14	105	1.72	47	<5.00	.00	0	3.63	3.79
AUG 13 1982		242	6.82	49	175	3.64	26	195	3.20	23	11	.38	3	14.04	14.45
AUG 27 1982		38	1.07	30	59	1.23	34	79	1.30	36	<5.00	.00	0	3.60	3.09*
SEPT 24 1982		165	4.65	45	140	2.91	28	162	2.66	26	5	.18	2	10.40	7.52*
SEPT 21 1983		1100	30.99	77	310	6.45	16	155	2.54	6	13	.44	1	40.42	40.69
SEPT 22 1983		1060	29.86	77	290	6.04	16	149	2.44	6	16	.54	1	38.87	40.93
OCT 17 1983		36	1.01	31	38	.79	24	88	1.44	44	<5.00	.00	0	3.24	3.37
OCT 18 1983		35	.99	28	37	.77	22	106	1.74	50	<5.00	.00	0	3.50	4.38*
FEB 17 1984		65	1.84	61	19	.39	13	49	.80	26	<5.00	.00	0	3.03	3.33
FEB 18 1984		67	1.88	56	20	.41	12	67	1.10	32	<5.00	.00	0	3.38	4.99*
SEPT 30 1984		140	3.94	47	74	1.54	19	157	2.58	31	7	.24	3	8.30	8.50
OCT 01 1984		138	3.89	46	81	1.69	20	171	2.80	33	<5.00	.00	0	8.37	8.72

TABLE VIII (cont'd)

* INDICATES ANION AND CATION TOTALS DON'T LIE WITHIN 10% OF EACH OTHER.

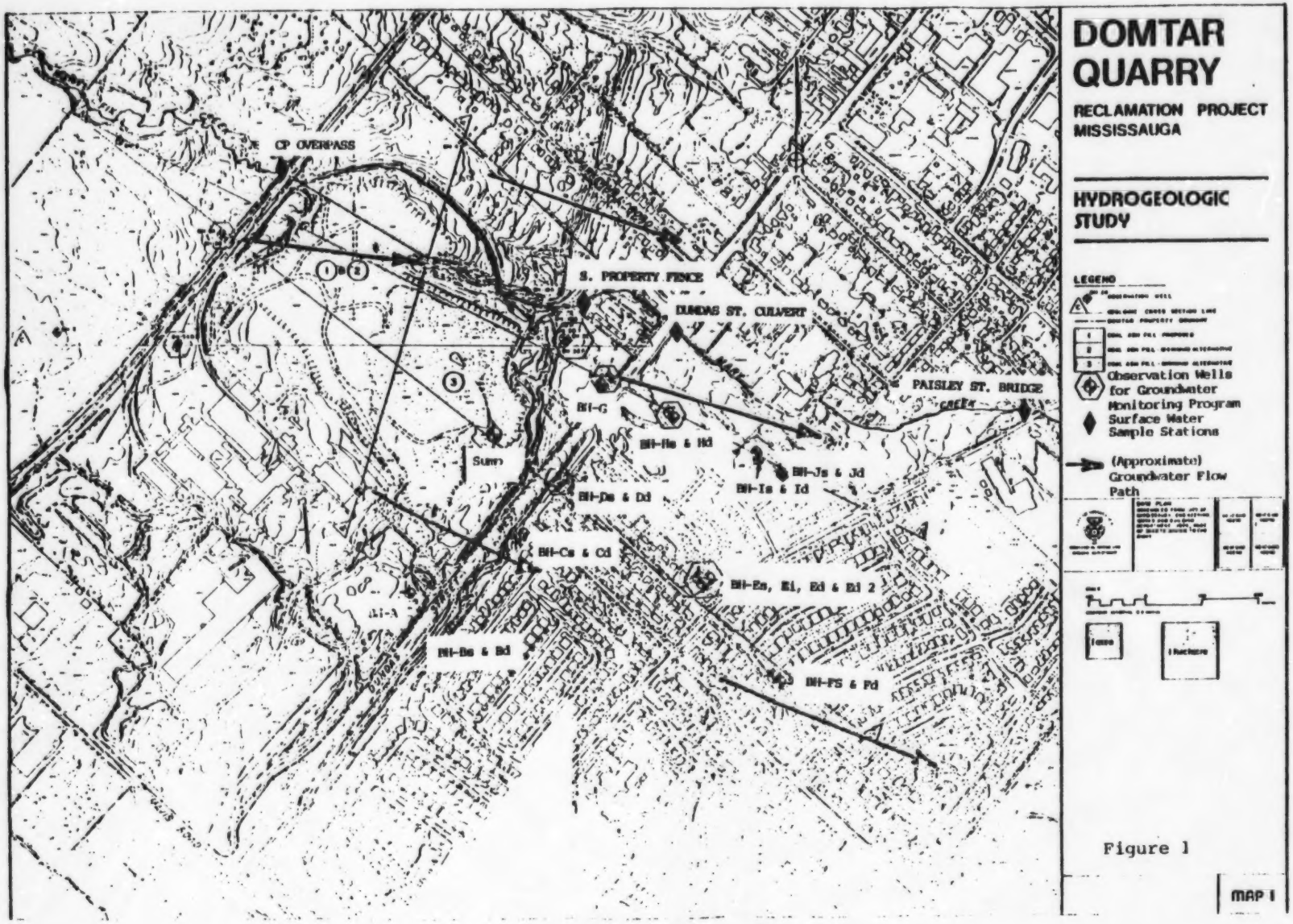
+ INDICATES A MAJOR PARAMETER IS MISSING.

TABLE IX

SUMMARY OF MINOR/TRACE COMPONENT CHEMISTRY FOR SAMPLING OF MARY FIX CREEK, FEBRUARY, 1984

Species	Total Concentration Range (mg/L)		MOE Water Quality Objective*/3/ (mg/L)	Comments - Relation to MOE Objectives/3/
	Filtered	Non-Filtered (total)		
Al	<0.5 to 0.5	6.8 to 12	Undefined Tolerance Limit	Al levels (as expected) generally greater in non-filtered samples.
As	All <0.001	0.001 to 0.003	0.1	Non-filtered samples consistently have higher As levels. All levels well below Objective.
Cd	All <0.0001	All <0.0001	0.0002	Cd did not exceed Objective.
Cu	0.003 to 0.009	0.012 to 0.023	0.005	Objective exceeded for non-filtered samples only.
Fe	0.06 to 0.10	9.6 to 21.6	0.3	Objective exceeded for non-filtered samples only.
Mn	0.07 to 0.08	0.34 to 0.65	Undefined Tolerance Limit	Mn levels (as expected) much greater in non-filtered samples.
Ni	All <0.005	All 0.01	0.025	Objective not exceeded.
Pb	All <0.002	0.008 to 0.023	0.025 mg/L (Alk > 80 mg/L)	Objective not exceeded
V	All <0.005	0.03 to 0.08	Undefined Tolerance Limit	V levels, as expected, generally greater in non-filtered samples.
Zn	All <0.02	0.03 to 0.10	0.03	Objective exceeded for non-filtered samples only.
SiO_2(sol)	2.9 to 3.4	12 (at CPO) to 126	-	SiO_2 levels very high downstream of CPO.

*Objectives are related to total (non-filtered) samples.


CP OVERPASS
S. PROPERTY FENCE
DUNDAS ST. CULVERT
PAISLEY ST. BRIDGE
CREEK
Sump
BH-G
BH-Ha & Hd
BH-Js & Jd
BH-Is & Id
BH-Ja & Dd
BH-Cs & Cd
BH-Es, Ei, Ed & Ei 2
BH-A
BH-Bs & Bd
BH-Fs & Fd
DOMTAR
QUARRY
RECLAMATION PROJECT
MISSISSAUGA
HYDROGEOLOGIC
STUDY
LEGEND
Observation Wells for Groundwater Monitoring Program
Surface Water Sample Stations
(Approximate) Groundwater Flow Path
Figure 1
MAP 1

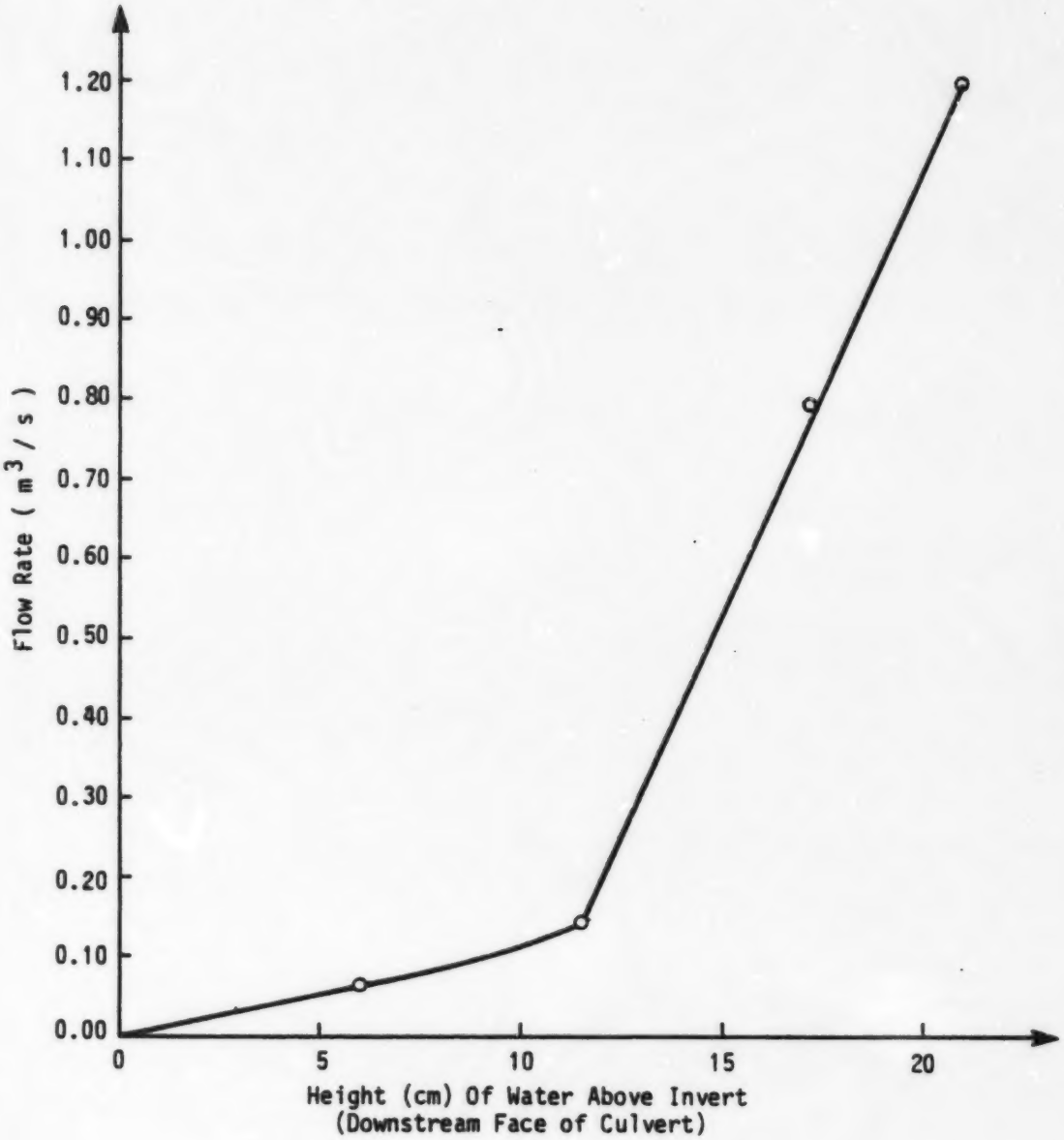


FIGURE 2

CALIBRATION CURVE OF MARY FIX CREEK DISCHARGE
AT CP RAILWAY OVERPASS

FIGURE 3

MAJOR ION CHEMISTRY
DOMTARSURF
TYPE - WATER
LOCATION CPO
DOMTAR QUARRY PIPER DIAGRAM

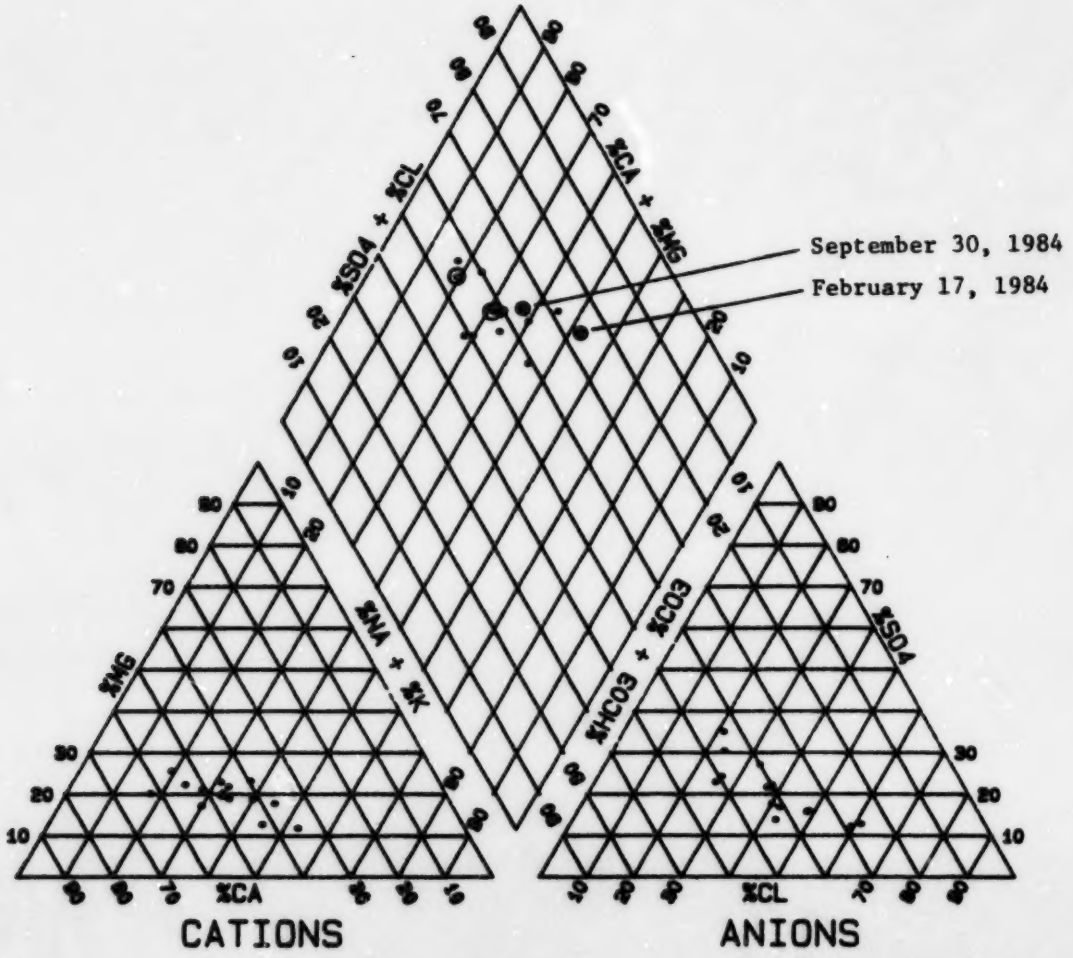


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FIGURE 4

MAJOR ION CHEMISTRY
DOMTARSURF
TYPE - WATER
LOCATION SPF
DOMTAR QUARRY PIPER DIAGRAM

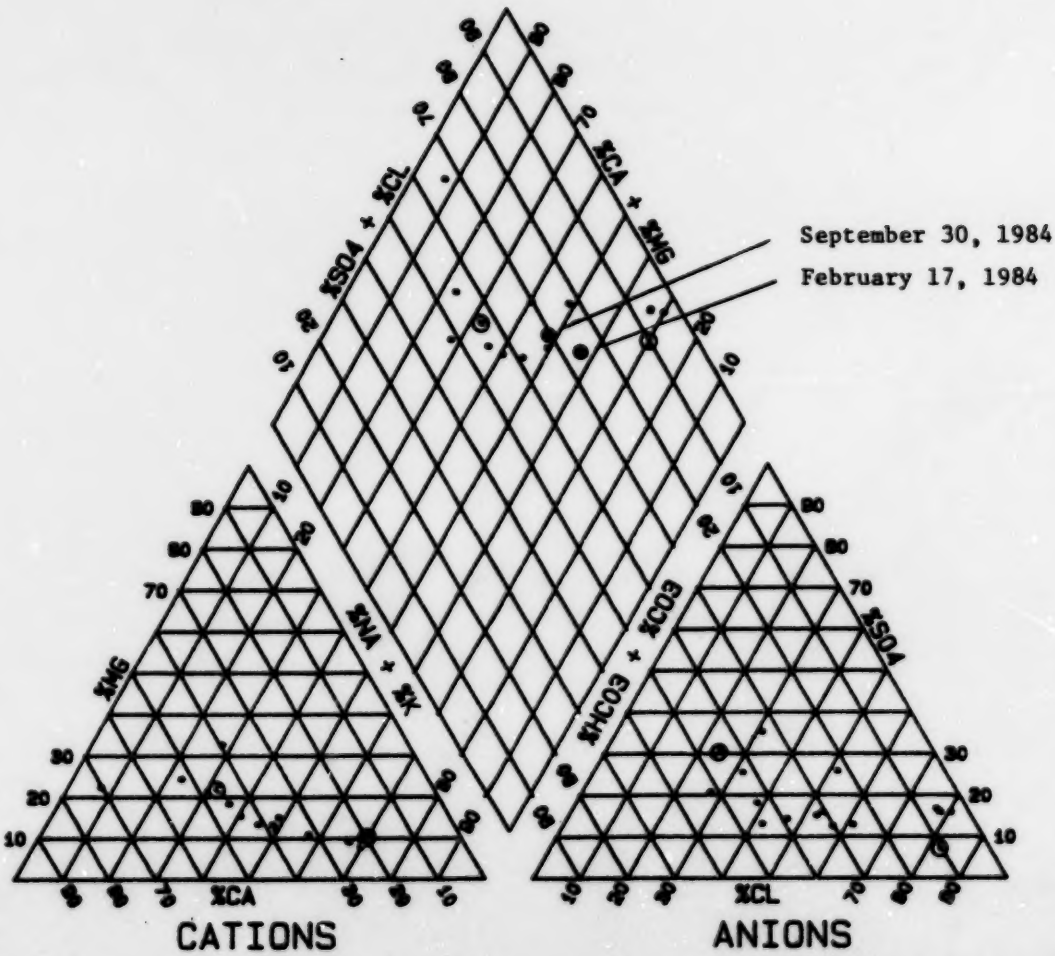

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FIGURE 5

MAJOR ION CHEMISTRY
DOMTARSURF
TYPE - WATER
LOCATION DSC
DOMTAR QUARRY PIPER DIAGRAM

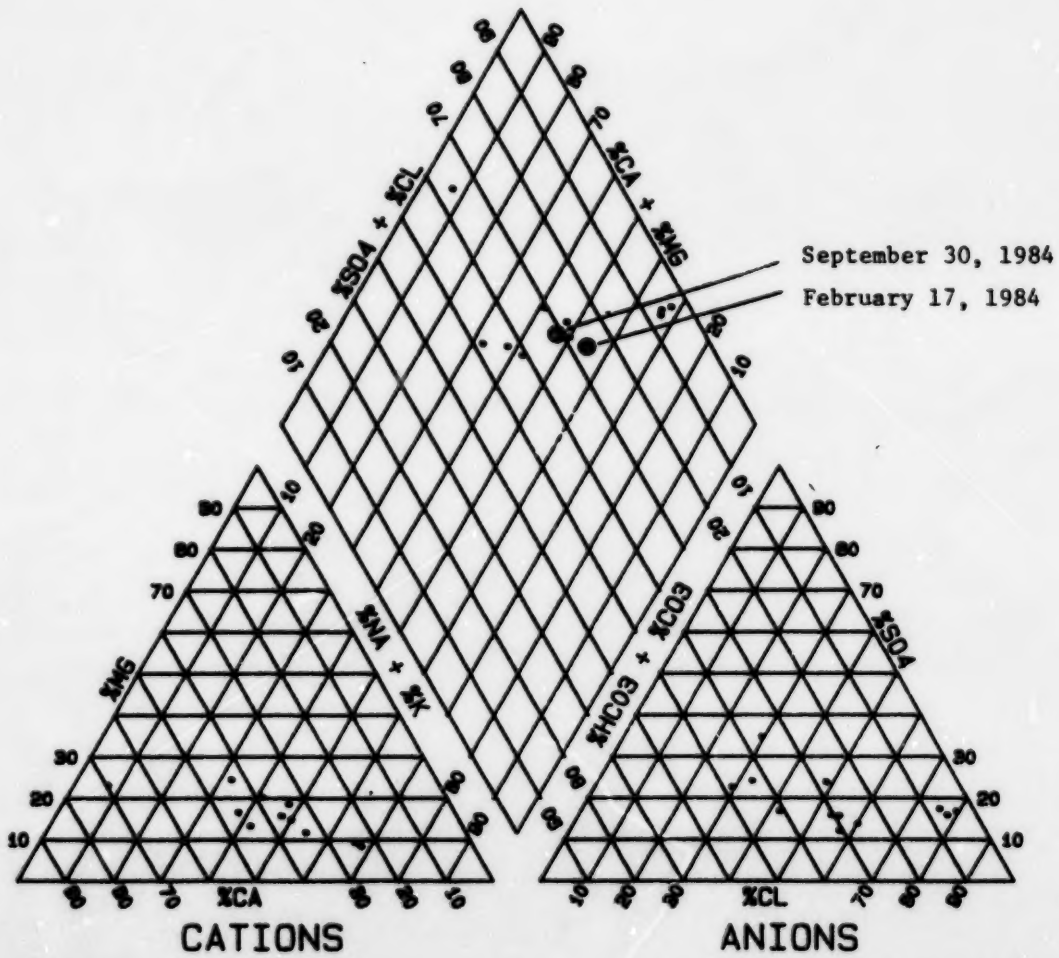

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FIGURE 6

MAJOR ION CHEMISTRY
DOMTARSURF
TYPE - WATER
LOCATION PSB
DOMTAR QUARRY PIPER DIAGRAM